

What is claimed is:

- 1 1. A system for bracketing a tissue volume comprising:
 - 2 a. a plurality of markers, each marker in said plurality having a maximum
3 dimension of no more than 5mm, as measured along any axis extending
4 through said each marker;
 - 5 b. a probe; and
 - 6 c. a detector connected to said probe that provides information when said probe
7 is moved proximate to one of said plurality of markers.
- 1 2. A system according to claim 1, wherein said maximum dimension is no more than
2 2mm.
- 1 3. A system according to claim 1, wherein said detector further includes at least one
2 selected from the group consisting of a sound source, a light source, a source of
3 pressurized air, a display for providing changing proximity information, a dial with a
4 movable needle, and a display for displaying an image.
- 1 4. A system according to claim 3, wherein said information is at least one of sound,
2 light, pressurized air, visually represented proximity information, movement of a
3 needle, and an image on a display that is provided, respectively, by said sound source,
4 said light source, said source of pressurized air, said display for providing changing
5 proximity information, said dial and said display for displaying an image.
- 1 5. A system according to claim 1, wherein said detector provides said information so
2 that an attribute thereof varies as a function of proximity of said probe to individual
3 markers in said plurality of markers.
- 1 6. A system according to claim 1, wherein at least one of said plurality of markers emits
2 gamma rays.

- 1 7. A system according to claim 1, wherein at least one of said plurality of markers
2 generates a magnetic field.
- 1 8. A system according to claim 1, wherein at least one of said plurality of markers
2 generates a radio frequency signal.
- 1 9. A system according to claim 1, wherein at least one of said plurality of markers
2 includes:
3 a. an antenna; and
4 b. a radio frequency generator connected to said antenna for generating a first
5 radio frequency signal having a first frequency for transmission by said
6 antenna.
- 1 10. A system according to claim 9, further including a circuit connected to said antenna
2 for detecting and regulating an exciter signal received by said antenna, wherein said
3 radio frequency generator is designed to generate said first radio frequency signal
4 using energy in said exciter signal.
- 1 11. A system according to claim 10, further including an exciter for generating said
2 exciter signal.
- 1 12. A system according to claim 1, wherein each of said plurality of markers includes:
2 a. an antenna;
3 b. a circuit connected to said antenna for generating a radio frequency signal, in
4 response to receipt of an exciter signal, having a frequency that is different
5 from frequencies of said radio frequency signals generated by other ones of
6 said plurality of markers; and
7 c. an exciter for generating said exciter signal, wherein said exciter signal does
8 not include a radio frequency signal having a frequency that is the same as
9 frequencies of said radio frequency signals generated by said plurality of
10 markers.

- 1 13. A system according to claim 1, wherein at least one of said plurality of markers
2 vibrates.
- 1 14. A system according to claim 1, wherein at least one of said plurality of markers
2 includes:
3 a. a piezo-electric device that oscillates mechanically in response to an
4 oscillating electrical signal; and
5 b. a circuit connected to said piezo-electric device that generates said oscillating
6 electrical signal.
- 1 15. A system according to claim 14, wherein said at least one of said plurality of markers
2 has a housing that is designed to resonate at a first frequency and said piezo-electric
3 device is coupled to said housing so that mechanical oscillations of said piezo-electric
4 device are transmitted from said piezo-electric device to said housing.
- 1 16. A system according to claim 14, wherein said at least one of said plurality of markers
2 includes:
3 a. an antenna for receiving an exciter signal;
4 b. wherein said circuit is connected to said antenna and is designed to generate
5 said oscillating electrical signal when said antenna receives said exciter signal;
6 and
7 c. an exciter for generating said exciter signal.
- 1 17. A system according to claim 1, wherein at least one of said plurality of markers
2 includes a plurality of plates that are configured, positioned and made from a material
3 such that said at least one marker strongly reflects ultrasound energy incident thereon.
- 1 18. A system according to claim 1, wherein at least one of said plurality of markers is
2 designed to reflect ultrasound energy incident thereon.

- 1 19. A system according to claim 1, wherein at least one of said plurality of markers
2 includes a capsule filled with a colored dye.
- 1 20. A system for bracketing a tissue mass comprising:
2 a. a plurality of markers, each having a detection characteristic;
3 b. a probe; and
4 c. a detector that detects said detection characteristic and provides a humanly
5 recognizable representation of proximity of said probe to one of said plurality
6 of markers that varies as a function of changes in said proximity.
- 1 21. A system according to claim 20, wherein said detection characteristic is gamma rays.
- 1 22. A system according to claim 20, wherein said detection characteristic is a magnetic
2 field.
- 1 23. A system according to claim 20, wherein said detection characteristic is radio
2 frequency electromagnetic energy.
- 1 24. A system according to claim 20, wherein said detection characteristic is imagability
2 by ultrasound energy.
- 1 25. A system according to claim 20, wherein said detector includes a sensor that
2 determines the strength of said detection characteristic and generates an output signal
3 having a magnitude that varies as a function of the strength of said detection
4 characteristic, as determined at said probe.
- 1 26. A surgical marker comprising:
2 a. a quantity of colored dye;
3 b. a capsule encasing said quantity of colored dye; and
4 c. wherein at least one of said dye and capsule is imaggable by at least one of
5 ultrasonic, magnetic resonance and X-ray energy.

1 27. A surgical marker according to claim 26, wherein said capsule has a maximum
2 dimension of no more than 5mm, as measured along any axis extending through said
3 capsule.

1 28. A cutting tool comprising:

2 a. a first portion including:

3 i. a first blade having a first edge with a first curved configuration;

4 ii. a first connector;

5 b. a second portion including:

6 i. a second blade having a second edge, wherein said second edge has a
7 second curved configuration that is designed so that when said second
8 blade is positioned in operative engagement with said first blade, said
9 first edge and said second edge form a substantially continuous cutting
10 edge;

11 ii. a second connector positioned and designed to releasably engage said
12 first connector so as to releasably secure said second blade in said
13 operative engagement with said first blade.

1 29. A cutting tool according to claim 28, wherein said first curved configuration and said
2 second curved configuration are selected so that said substantially continuous cutting
3 edge is circular.

1 30. A cutting tool according to claim 28, further wherein said first portion has a first
2 handle and said second portion has a second handle.

1 31. A cutting tool according to claim 30, wherein said first connector is attached to said
2 first handle and said second connector is attached to said second handle.

- 1 32. A tissue anchor comprising:
- 2 a. an elongate tube having a central bore, a distal end and a proximal end,
- 3 wherein said tube has at least one aperture adjacent said distal end;
- 4 b. an elongate member having a portion sized for receipt and axial movement in
- 5 said central bore between a first position and a second position, wherein said
- 6 elongate member includes a longitudinal axis and at least one anchor member
- 7 attached to said portion; and
- 8 c. wherein said at least one anchor member is configured and positioned so that
- 9 when said portion is in said first position said at least one anchor member is at
- 10 least partially received in said elongate tube and when said portion is in said
- 11 second position said at least one anchor member projects through said at least
- 12 one aperture and extends transversely relative to said longitudinal axis.
- 1 33. A tissue anchor according to claim 32, further wherein said elongate tube has an
- 2 outside diameter ranging 0.5mm to 12mm.
- 1 34. A tissue anchor according to claim 32, wherein said outside diameter ranges from
- 2 1mm to 3mm.
- 1 35. A tissue anchor according to claim 32, wherein said at least one anchor member
- 2 includes four anchor members.
- 3
- 4 36. A tissue anchor according to claim 32, wherein said at least one anchor member has a
- 5 curved configuration when said portion is in said second position.
- 1 37. A system for bracketing, stabilizing and removing a tissue volume comprising:
- 2 a. a marker system including:
- 3 i. a plurality of markers, each marker in said plurality having a maximum
- 4 dimension of no more than 5mm, as measured along any axis
- 5 extending through said each marker;
- 6 ii. a probe; and

- 7 iii. a detector connected to said probe that provides information when said
- 8 probe is moved proximate to one of said plurality of markers;
- 9 b. a cutter including:
- 10 i. a first portion having:
- 11 (1) a first blade having a first edge with a first curved
- 12 configuration;
- 13 (2) a first connector;
- 14 ii. a second portion having:
- 15 (1) a second blade having a second edge, wherein said second edge
- 16 has a second curved configuration that is designed so that
- 17 when said second blade is positioned in operative engagement
- 18 with said first blade, said first edge and said second edge form a
- 19 substantially continuous cutting edge;
- 20 (2) a second connector positioned and designed to releasably
- 21 engage said first connector to releasably secure said second
- 22 blade in said operative engagement with said first blade; and
- 23 c. a tissue anchor including:
- 24 i. an elongate tube having a central bore, a distal end and a proximal end,
- 25 wherein said tube has at least one aperture adjacent said distal end;
- 26 ii. an elongate member having a portion sized for receipt and axial
- 27 movement in said central bore between a first position and a second
- 28 position, wherein said elongate member includes a longitudinal axis
- 29 and at least one anchor member attached to said portion; and
- 30 iii. wherein said at least one anchor member is configured and positioned
- 31 so that when said portion is in said first position said at least one
- 32 anchor member is at least partially received in said elongate tube and
- 33 when said portion is in said second position said at least one anchor
- 34 member projects through said at least one aperture and extends
- 35 transversely relative to said longitudinal axis.

1 38. A method of removing a tissue volume from a tissue portion using a plurality of

2 markers, the method comprising the steps:
3 a. positioning a plurality of markers so as to define a boundary of the tissue
4 volume;
5 b. detecting the location of a first one of the plurality of markers; and
6 c. incising portions of the tissue portion adjacent said first one of the plurality of
7 markers substantially along said boundary adjacent said location.

1 39. A method according to claim 38, wherein said positioning step is performed so that
2 said plurality of markers define said boundary in three dimensions.

1 40. A method according to claim 38, wherein said positioning step is performed so that
2 said plurality of markers define said boundary in two dimensions.

1 41. A method according to claim 38, wherein said positioning step is performed so that
2 said plurality of markers define said boundary in one dimension.

1 42. A method according to claim 38, wherein said positioning step involves positioning
2 the plurality of markers using ultrasound imaging to guide placement of the plurality
3 of markers.

1 43. A method according to claim 38, wherein said positioning step involves positioning
2 the plurality of markers using X-ray imaging to guide placement of the plurality of
3 markers.

1 44. A method according to claim 38, wherein said positioning step involves positioning
2 the plurality of markers using magnetic resonance imaging to guide placement of the
3 plurality of markers.

1 45. A method according to claim 38, wherein said positioning step involves positioning
2 the plurality of markers using CAT-scan imaging to guide placement of the plurality
3 of markers.

- 1 46. A method according to claim 38, wherein the plurality of markers includes three pairs
2 of markers, further wherein said positioning step involves positioning the three pairs
3 of markers so that markers of each pair lie on said boundary in mutually spaced
4 relation substantially on opposite sides of the tissue volume.
- 1 47. A method according to claim 38, wherein said positioning step involves positioning
2 said plurality of markers so that at least two of said plurality of markers lie on an X
3 axis and at least two of said plurality of markers lie on a Y axis, wherein said X axis
4 and said Y axis intersect said tissue volume and extend in non-coaxial relation.
- 1 48. A method according to claim 38, further including the steps of repeating said
2 detecting step and said incising step with respect to other ones of the plurality of
3 markers.
- 1 49. A method according to claim 38, further including the steps of repeating said
2 detecting step and said incising step with respect to all of said plurality of markers
3 until the tissue volume is separated from the tissue portion.
- 1 50. A method according to claim 38, further comprising the step, before said positioning
2 step, of identifying a tissue mass located in the tissue volume.
- 1 51. A method of removing a tissue volume comprising the steps:
2 a. forming an incision in skin covering the tissue volume;
3 b. providing a cutter having a first portion and a second portion, wherein said
4 first portion and said second portion are designed to be attached together in
5 operative engagement, said cutter having a cutting edge for cutting the tissue
6 volume;
7 c. inserting said first portion through said incision;
8 d. inserting said second portion through said incision and attaching said first
9 portion to said second portion so as to create said operative engagement; and

10 e. applying a rotational force and a downward force toward the tissue volume to
11 said cutter so as to cause said cutting edge to cut the tissue volume.

1 52. A method according to claim 51, further comprising the step, prior to said step b, of
2 positioning a plurality of markers so as to define a boundary of the tissue volume and
3 the step, after said step d and before said step e, of identifying said boundary by
4 detecting the position of said plurality of markers and then positioning said cutter in
5 alignment with said boundary.

1 53. A method of bracketing a tissue mass in a piece of tissue using a plurality of markers,
2 the method comprising the steps:
3 a. generating an image of the tissue mass; and
4 b. referring to said image of the tissue mass, positioning the plurality of markers
5 in the piece of tissue so as to define a boundary of a tissue volume that
6 includes the tissue mass.

1 54. A method according to claim 53, further comprises the step after said step a and
2 before said step b of positioning the plurality of markers proximate the tissue mass
3 and generating an image of the plurality of markers, further wherein said step b
4 involves referring to said image of the plurality of markers in connection with said
5 positioning.

1 55. A method according to claim 53, wherein said step b involves positioning the plurality
2 of markers so that two of said plurality of markers are positioned on an X axis, two of
3 said plurality of markers are positioned on a Y axis and two of said plurality of
4 markers are positioned on a Z axes, said X, Y and Z axes intersecting the tissue
5 volume and extending in non-coplanar relation.

1 56. A method according to claim 53, wherein said step b involves positioning the plurality
2 of markers so that said X, Y and Z axes are substantially mutual orthogonal.

- 1 57. A method according to claim 53, wherein said step b is performed so that the plurality
2 of markers defines said boundary in one dimension.
- 1 58. A method according to claim 53, wherein said step b is performed so that the plurality
2 of markers defines said boundary in two dimensions.
- 1 59. A method according to claim 53, wherein said step b is performed so that the plurality
2 of markers defines said boundary in three dimensions.
- 1 60. A method according to claim 53, wherein said step b is performed so that said at least
2 two of the plurality of markers are positioned on an X_1 axis and at least two of the
3 plurality of markers are positioned on a Y_1 axis, wherein said X_1 axis and said Y_1 axis
4 are offset along said Z axis, respectively, from said X axis and said Y axis.
- 1 61. A method of removing a tissue mass and surrounding tissue volume from a piece of
2 tissue, the method comprising the steps:
3 a. positioning a plurality of markers in the piece of tissue so as to define a
4 boundary of the tissue volume;
5 b. identifying said boundary by detecting the position of said plurality of
6 markers;
7 c. incising portions of said tissue volume adjacent said plurality of markers
8 substantially along said boundary based on said position of said plurality of
9 markers; and
10 d. stabilizing the tissue volume during said incising step.
- 1 62. A method according to claim 61, wherein said identifying step and said incising step
2 are repeated until said tissue volume is removed from the piece of tissue.
- 1 63. A method according to claim 61, wherein said incising step is performed so that said
2 incising extends in a second direction that is different than said first direction.

- 1 64. A method according to claim 61, wherein said stabilizing step involves pulling the
2 tissue volume in a first direction.